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Amendment filed October 15, 2008
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AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (Currently Amended): A simulation method for simulating an amount of occurrence of local flare which occurs in an exposure process using a photo mask in manufacturing a semiconductor device for use in optical corrections to obtain a more accurate optical image, comprising the steps of:

dividing a layout of a photo mask into a plurality of areas,

calculating an average value of light intensity in each of the areas,

estimating the amount of occurrence of local flare in each of the areas on the basis of each of the average values, and

correcting dimensions of the photo mask based on the estimated amount of occurrence of local flare, wherein

when a circular-shaped light source is used, the average value of light intensity $\bar{I} = \sum_{k=1}^{N} F_k S_k S_k^*$, and N is 1 or more natural number, F_k is a weighting factor of diffracted light, S_k is the amplitude of the diffracted light, and $F_k = A_k/(\sigma^2\pi)$ where A_k is the area shared between a circle C having a radius NA, the numerical aperture of [[the]] a lens, and a circle S_k

having a radius of the light source with respect to NA, and σ is the radius of the circular shaped light source with respect to NA, and

when a ring-shaped light source is used, ~~$F_k = A_k / (\sigma_2^2 \pi - \sigma_1^2 \pi)$~~ the average value of light intensity $\bar{I} = \sum_{k=1}^{N} F_k' S_k' S_k'^*$, and N is 1 or more natural number, F_k' is a weighting factor of diffracted light, S_k' is the amplitude of the diffracted light, and $F_k' = A_k' / (\sigma_2^2 \pi - \sigma_1^2 \pi)$ where A_k' is the area shared between a circle C having a radius NA, the numerical aperture of a lens, and a ring S_k' having a radius of the light source with respect to NA, where σ_1 is the inside radius and σ_2 is the outside radius of the ring-shaped light source with respect to NA.

Claim 2 (Original): The simulation method according to claim 1, wherein

each of the average values is subjected to smoothing processing, a smoothed average value is multiplied by a first multiplier, and an obtained value is evaluated as the amount of occurrence of local flare in each of the areas.

Claim 3 (Original): The simulation method according to claim 1, wherein

when the average value of light intensity in each of the areas is calculated, diffracted light is calculated by a Fourier transformed image of each of the areas of the layout, and the average value is calculated by multiplying the light intensity of the diffracted light passing through a projection lens by a second multiplier.

Claim 4 (Original): The simulation method according to claim 1, wherein

each of the values evaluated as the amount of occurrence of local flare is added to the light intensity in order to simulate an optical image.

Claim 5 (Original): The simulation method according to claim 1, wherein

each of the values evaluated as the amount of occurrence of local flare is used in optical proximity correction.

Claim 6 (Currently Amended): Simulation equipment for simulating an amount of occurrence of local flare which occurs in an exposure process in manufacturing a semiconductor device for use in optical corrections to obtain a more accurate optical image, comprising:

division unit means for dividing a layout of a photo mask into a plurality of areas;

average light intensity value calculation unit means for calculating an average value of light intensity in each of the areas, and

means for correcting dimensions of the photo mask based on the estimated amount of occurrence of local flare, wherein

the amount of occurrence of local flare in each of the areas is estimated on the basis of each of the average values, and

when a circular-shaped light source is used, the average value of light intensity $\bar{I} = \sum_{k=1}^{N} F_k S_k S_k^*$, and N is 1 or more natural number, F_k is a weighting factor of diffracted light ~~and~~, S_k is the amplitude of the diffracted light, and $F_k = A_k/(\sigma^2\pi)$ where A_k is the area shared between a circle C having a radius NA, the numerical aperture of [[the]] a lens, and a circle S_k

having a radius of the light source with respect to NA, and σ is the radius of the circular shaped light source with respect to NA, and

when a ring-shaped light source is used, ~~$F_k = A_k / (\sigma_2^2 \pi - \sigma_1^2 \pi)$~~ <u>the average value of light intensity $\bar{I} = \sum_{k=1}^{N} F_k' S_k' S_k'^*$, and N is 1 or more natural number, F_k' is a weighting factor of diffracted light, S_k' is the amplitude of the diffracted light, and $F_k' = A_k' / (\sigma_2^2 \pi - \sigma_1^2 \pi)$ where A_k' is the area shared between a circle C having a radius NA, the numerical aperture of a lens, and a ring S_k' having a radius of the light source with respect to NA,</u> where σ_1 is the inside radius and σ_2 is the outside radius of the ring-shaped light source with respect to NA.

Claim 7 (Previously Presented): The simulation equipment according to claim 6 further comprising:

smoothing unit means for subjecting the calculated average value to smoothing processing, and multiplication unit means for multiplying the smoothed average value by a first multiplier,

wherein each obtained value is evaluated as the amount of occurrence of local flare in each of the areas.

Claim 8 (Original): The simulation equipment according to claim 6, wherein

when the average value of light intensity in each of the areas is calculated, diffracted light is calculated by a Fourier transformed image of each of the areas of the layout, and the average

value is calculated by multiplying the light intensity of the diffracted light passing through a projection lens by a second multiplier.

Claim 9 (Original): The simulation equipment according to claim 6, wherein

each of the values evaluated as the amount of occurrence of local flare is added to the light intensity in order to simulate an optical image.

Claim 10 (Original): The simulation equipment according to claim 6, wherein

each of the values evaluated as the amount of occurrence of local flare is used in optical proximity correction.

Claim 11 (Currently Amended): A computer-readable storage medium having stored thereon a computer program for use in optical corrections to obtain a more accurate optical image for simulating an amount of occurrence of local flare which occurs in an exposure process in manufacturing a semiconductor executable to perform the steps of:

dividing a layout of a photo mask into a plurality of areas;

calculating an average value of light intensity in each of the areas;

simulating and estimating an amount of occurrence of local flare in each of the areas on the basis of each of the average values, for use in optical corrections to obtain a more accurate optical image, and

~~means for~~ correcting dimensions of the photo mask based on the estimated amount of occurrence of local flare, wherein

when a circular-shaped light source is used, the average value of light intensity $\bar{I} = \sum_{k=1}^{N} F_k S_k S_k^*$, and N is 1 or more natural number, F_k is a weighting factor of diffracted light, S_k is the amplitude of the diffracted light, and $F_k = A_k/(\sigma^2\pi)$ where A_k is the area shared between a circle C having a radius NA, the numerical aperture of [[the]] a lens, and a circle S_k having a radius of the light source with respect to NA, and σ is the radius of the circular shaped light source with respect to NA, and

when a ring-shaped light source is used, ~~$F_k = A_k / (\sigma_2^2\pi - \sigma_1^2\pi)$~~ the average value of light intensity $\bar{I} = \sum_{k=1}^{N} F_k' S_k' S_k'^*$, and N is 1 or more natural number, F_k' is a weighting factor of diffracted light, S_k' is the amplitude of the diffracted light, and $F_k' = A_k' / (\sigma_2^2 \pi - \sigma_1^2 \pi)$ where A_k' is the area shared between a circle C having a radius NA, the numerical aperture of a lens, and a ring S_k' having a radius of the light source with respect to NA, where σ_1 is the inside radius and σ_2 is the outside radius of the ring-shaped light source with respect to NA.

Claim 12 (Cancelled):